

# **HINGE SYSTEM FOR COMBINATION HAND TRUCK, STEP LADDER AND DOLLY DEVICE**

## **5 RELATED APPLICATION DATA**

The present application is a continuation-in-part of U.S. Application No. 10/412,610 entitled "Combination Hand Truck, Step Ladder and Dolly," filed on April 11, 2003. The present application also claims benefit of U.S. Provisional Application No. 60/479,902, entitled "Improved Combination Hand Truck, Step Ladder and  
10 Dolly," filed on June 19, 2003 and U.S. Provisional Application No. 60/496,356, entitled "Safety Features for a Combination Hand Truck, Step Ladder, and Dolly," filed on August 18, 2003.

## **FIELD OF THE INVENTION**

15 The present invention generally relates to a multi-use hand truck, and more specifically, to a hinge of a device that secures a hand truck frame with a step ladder frame for use as a step ladder, hand truck, or dolly.

## **BACKGROUND OF THE INVENTION**

20 The use of hand trucks, dollies, and step ladders by private individuals and businesses is widely known. Such devices are commonly used for moving, lifting, and supporting loads in the performance of various physical tasks. Accordingly, the need and desirability for such devices is without question, and need not be discussed herein.

Numerous designs have been utilized over the years for individual hand truck,  
25 dolly and step ladder devices. In fact, such devices have been combined into a single device, such as the combination hand truck, step ladder, and basket carrier of U.S. Patent No. 6,173,811, the combined hand truck and ladder of U.S. Patent No. 4,106,590, the step ladder dolly of U.S. Patent No. 3,954,155, and the hand truck of U.S. Patent No. 3,104,889.

30 However, these combination devices have generally failed in providing the user completely functional embodiments of the respective individual devices. The task of

combining multiple functionalities into a single device is inherently difficult to do without sacrificing some of the functionality in exchange for the added convenience of having the combination in a single device. For example, the hand truck of the '889 patent does not have an upright handle in the dolly configuration, only has three wheels in the dolly configuration, and does not provide for the locking of the ladder support or prop in the hand truck configuration. As further examples, the step ladder dolly of the '155 patent does not have an upright handle in the dolly configuration, and the combined hand truck and ladder of the '590 patent requires the device to be inverted from the hand truck configuration in order to configure the device as a step ladder, as shown in FIG. 7 thereof. In addition, the step ladder configuration of the '590 patent is limited in the load that it can support based upon the design of the back frame member, which supports the ladder. As a final example, the combination hand truck, step ladder, and basket carrier of the '811 patent does not include a dolly configuration nor means for locking the hand truck support frame assembly and the step ladder support frame assembly together when in use, such as in the hand truck configuration.

Thus, an unresolved need exists in the industry for a combination hand truck, step ladder and dolly that is fully functional in each configuration and a hinge system that secures the device in certain configurations.

## SUMMARY OF THE INVENTION

One embodiment of the present invention provides a multi-use move, lift, and support device. The device is made of a step ladder frame including a plurality of steps and a hand truck frame. At least one hinge pivotally connects the step ladder frame to the hand truck frame. An anti-wobble hook may be used to lock the frames in a step ladder configuration. The hook is moved in position by the force of gravity.

Another aspect of the invention includes a top step that is pivotally connected to the step ladder frame. Upward rotation of the top step may disconnect the anti-wobble hook from the hinge and thus unlock the device.

Another aspect of the invention includes a substantially J-shaped anti-wobble hook. Yet another aspect of the invention includes the anti-wobble hook securing a pin attached to the hand truck frame into a notch in a bracket of the hinge.

Another embodiment of the present invention provides another multi-use move, lift, and support device. The device is made of a step ladder frame including a plurality of steps and a hand truck frame. A pin may be connected to the hand truck frame. At least one hinge pivotally connects the step ladder frame to the hand truck frame. The hinge may include a bracket that has an arcuate surface. The bracket includes at least one notch such that the configuration of the devices can be modified by positioning the pin in the notches. An anti-wobble hook may be used to lock the frames in a step ladder configuration. The hook is moved in position by the force of gravity and partially wraps around the bottom portion of the pin to secure the pin into the notch.

Yet another embodiment of the present invention provides a step ladder device. The device is made of a step ladder frame including a plurality of steps and a hand truck frame. A pin may be connected to the hand truck frame. At least one hinge pivotally connects the step ladder frame to the hand truck frame. The hinge may include a bracket. The bracket includes at least one notch such that the configuration of the devices can be modified by positioning the pin in the notches. An anti-wobble hook may be used to lock the frames in a step ladder configuration. The hook is moved in position by the force of gravity and partially wraps around the bottom portion of the pin to secure the pin into the notch.

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## BRIEF DESCRIPTION OF THE DRAWINGS

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 is a perspective view of a combination hand truck, dolly, and step ladder device in accordance with the present invention in a hand truck configuration.

FIGS. 2A-2B are perspective views of the combination device of FIG. 1 showing a support plate in an upright position and lowered position in accordance with an embodiment of the present invention.

FIG. 3 is a partial cross sectional view taken along line 3' - 3' of FIG. 2A, showing a retaining clip for the support plate in accordance with an embodiment of the present invention.

FIGS. 4A-4C are views of a combination hand truck, dolly, and step ladder device in accordance with the present invention in a hand truck configuration, showing a collapsible crate installed thereon.

FIGS. 4D-4F are views of an alternative embodiment for attaching a collapsible  
5 crate to a combination hand truck, dolly and step ladder device in accordance with the present invention.

FIG. 5 is a perspective view of a combination hand truck, dolly, and step ladder device in accordance with the present invention in a step ladder configuration.

FIG. 6 is a partial cut-away side view of a combination hand truck, dolly and step  
10 ladder device according to the present invention in the step ladder configuration, showing the top step in use locking the frames of the device in the step ladder configuration.

FIG. 7 is a perspective view of a combination hand truck, dolly, and step ladder device in accordance with the present invention in the dolly configuration.

FIG. 8A is a partial perspective view of a combination hand truck, dolly and step  
15 ladder device in accordance with the present invention, showing a dolly support bar.

FIG. 8B is a cross section view taken along line 8b'-8b' of FIG. 8A showing the dolly support bar in a stored upright position.

FIG. 9A is a perspective view of a detachable tray for use with a combination  
20 hand truck, dolly and step ladder device of the present invention in either a step ladder configuration or a dolly configuration.

FIG. 9B is a perspective view of a combination hand truck, dolly, and step ladder device in accordance with the present invention in a step ladder configuration with the detachable tray of FIG. 9A attached thereto.

FIG. 9C is a perspective view of a combination hand truck, dolly, and step ladder  
25 device in accordance with the present invention in a dolly configuration with the detachable tray of FIG. 9A attached thereto.

FIG. 10A is a perspective view of an alternate embodiment of a detachable tray for use with a combination hand truck, dolly and step ladder device of the present invention in either a step ladder configuration or a dolly configuration.

FIG. 10B is a perspective view of the detachable tray of FIG. 10A for use with a combination hand truck, dolly, and step ladder device in accordance with the present invention in a step ladder configuration.

FIG. 10C is a perspective view of the detachable tray of FIG. 10A for use with a combination hand truck, dolly, and step ladder device in accordance with the present invention in a dolly configuration.

FIG. 11A is a perspective view of a detachable seat for use with a combination hand truck, dolly and step ladder device in accordance with the present invention in a step ladder configuration of the present invention.

FIG. 11B is a bottom perspective view of the detachable seat of FIG. 11A.

FIG. 11C is a partial side view of the detachable seat of FIG. 11A attached to a combination hand truck, dolly, and step ladder device in accordance with the present invention.

FIG. 11D is a perspective view of a combination hand truck, dolly, and step ladder device in accordance with the present invention in the step ladder configuration showing how the seat of FIG. 11A may be attached thereto.

FIG. 12 is a perspective view of an alternative embodiment for the hinge between the step ladder frame and the hand truck frame.

FIGS. 13-14 are perspective views of an alternative embodiment for the hinge between the step ladder frame and the hand truck frame.

FIG. 15 is a perspective view of an alternative embodiment for the looped arms attached to the top step of the step assembly.

FIG. 16 is a rear perspective view of an alternative embodiment for the hinge between the step ladder frame and the hand truck frame including the anti-wobble hook where the combination hand truck, step ladder, and dolly device is in a step ladder configuration.

FIG. 17 is a partial perspective view of the embodiment for the hinge shown in FIG. 16 showing the anti-wobble hook.

FIG. 18 is a side perspective view of the embodiment for the hinge shown in FIG. 16 showing the anti-wobble hook.

FIG. 19 top is a perspective view of the alternative embodiment for the hinge shown in FIG. 16 where the combination hand truck, step ladder, and dolly is in a dolly configuration.

5 FIG. 20 is a perspective view of the alternative embodiment for the hinge shown in FIG. 16 where the combination hand truck, step ladder, and dolly is in a dolly configuration.

FIG. 21 is a perspective view of the alternative embodiment for the hinge shown in FIG. 16 with the hand truck frame folded parallel to the step ladder frame.

10 FIG. 22 is a perspective view of an alternative embodiment for the bracket of the hinge between the step ladder frame and the hand truck frame.

FIG. 23 is a perspective view of the detachable tray for use with a combination hand truck, dolly, and step ladder device in accordance with the present invention in a step ladder configuration.

15 FIG. 24 is a partial perspective view of the lip of the detachable tray of the combination hand truck, dolly, and step ladder device of FIG. 23.

FIG. 25 is a perspective view of a detachable seat for use with a combination hand truck, dolly and step ladder device in accordance with the present invention in a step ladder configuration of the present invention.

20 FIG. 26 is a partial side view of the detachable seat attached to a combination hand truck, dolly, and step ladder device in accordance with the present invention.

FIG. 27 is a perspective view of a holder attachment for use with a combination hand truck, dolly and step ladder device in accordance with the present invention.

FIG. 28 is a perspective view of the holder attachment separate from the combination hand truck, dolly and step ladder device of FIG. 27.

25 FIG. 29 is a perspective view of a combination hand truck, dolly and step ladder device according to the present invention, showing a trash bag holder.

FIG. 30 is a partial perspective view of a combination hand truck, dolly and step ladder device according to the present invention, showing an alternative embodiment of the top step in use locking the frames of the device in the step ladder configuration.

30 FIG. 31 is a bottom perspective view of the top step shown in FIG. 25

FIG. 32 is a perspective view of a support plate lock of a combination hand truck, dolly and step ladder device according to the present invention in a lowered position.

FIG. 33 is a perspective view of a support plate lock of a combination hand truck, dolly and step ladder device according to the present invention in an upright position.

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## DETAILED DESCRIPTION

The present inventions now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these  
10 embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

The present invention provides for a multi-use move, lift and support device that is illustrated herein as a combination hand truck, dolly and step ladder device. A device  
15 in accordance with the present invention provides the full functionality of a hand truck, dolly and step ladder integrated into a single design that is lightweight, easy to operate, and can be easily converted from one configuration to another. A description of each and every use of a device in accordance with the present invention would be too voluminous to include herein, so the present disclosure is directed to those embodiments and uses that  
20 are believed to be most clearly representative of the present invention. However, the present invention should not be limited merely to the embodiments and uses disclosed herein, but should be construed to include all of the concepts and teachings disclosed herein.

With reference to FIG. 1, a multi-use device 10 in accordance with the present  
25 invention is illustrated in a hand truck configuration. The multi-use device comprises a step ladder frame 12 and a hand truck frame 14 that is pivotally connected to the step ladder frame 12 by a hinge 16 so as to pivot about a pivot pin 18.

The step ladder frame 12 includes a first elongated leg 20 and a second elongated leg 22 interconnected at a first end by a U-shaped handle 24. Cross members 26 and 27  
30 interconnect the elongated legs 20, 22 at a distal end opposite the U-shaped handle 24. A step assembly 28 is pivotally connected to the step ladder frame 12 between the elongated

legs 20, 22. The step assembly 28 includes two lower steps 30, 31 and a top step 32, all of which are interconnected by connecting member 34 pivotally connected to the step ladder frame 12. The connecting member 34 is pivotally attached to each step on both sides. Thus, when the top step 32 rotates, subsequently steps 30 and 31 also rotate in a coordinated fashion, as discussed further below with reference to the step ladder embodiment. A first pair of wheels 40 is attached to the step ladder frame 12 at the first end near the U-shaped handle 24. A second pair of wheels 42 is attached to the step ladder frame 12 at a second end near the cross member 26. The wheels can be of any suitable design, but are preferably caster weldment.

10 In the embodiment illustrated in FIG. 1, each wheel of the first pair of wheels 40 and the second pair of wheels 42 are attached to the step ladder frame 12 by a sleeve that fits about the frame 12 in a manner so as to be rotatable about the frame 12. A spring-loaded button is provided in the frame 12 for engaging holes in the sleeve in order to hold the wheel in place. The position in which the wheels may be locked in place is  
15 determined by the position of the holes and the spring-loaded button, which can be placed where desired. Accordingly, as illustrated in FIG. 1, the first pair of wheels 40 is rotated inward when the device 10 is in the hand truck configuration.

The hand truck frame 14 includes a cross member 50 near a first end of the hand truck frame 14 near hinge 16, and a handle cross member 52 at a second end of the hand truck frame opposite the first end. A pivotally mounted support plate 54 is attached at the  
20 second end of the hand truck frame 14 for supporting objects that may be lifted or carried when using the device 10 in the hand truck configuration.

With reference to FIGS. 2A-2B, the support plate 54 is illustrated in more detail in both a lowered position (FIG. 2A) and in an upright stored position. The support plate  
25 54 includes locking means 56 for securing the step ladder frame 12 and the hand truck frame 14 together, such as in the hand truck configuration. The locking means 56 in the illustrated embodiment comprises a plate 58 having attached a lip 60 at one edge and a hook 62 at a side edge. Accordingly, as illustrated in FIG. 2A, when the support plate 54 is in a lowered position, the lip 60 engages the cross member 27 of the step ladder frame  
30 12 so as to secure step ladder frame 12 to the hand truck frame 14 during use in the hand truck configuration. As illustrated in FIG. 2B, when the support plate 54 is in an upright



stored position, the hook 62 engages the cross member 27 of the step ladder frame 12 to secure the hand truck frame 14 to the step ladder frame 12 when in use in the hand truck configuration.

With reference to FIG. 3, spring clips 64 are attached to the hand truck frame 14 for receiving and holding the support plate 54 in an upright rest position. Alternatively, magnetic latches can be utilized in place of the spring clips 64. Specifically, one or more brackets with magnets attached thereto can be secured to the hand truck frame 14 at substantially the same location as the spring clips 64. Thus, when the support plate 54 is moved into an upright position, the magnetic bracket(s) would engage and hold the support plate 54.

Accordingly, with reference back to FIG. 1, the device 10 can be configured as a hand truck by placing the step ladder frame 12 and the hand truck frame 14 in a close proximity to one another so that the elongated legs of each frame are oriented in a substantially parallel fashion. The step ladder frame 12 and hand truck frame 14 can be secured together by locking means 56. To assist in securing the step ladder frame 12 and the hand truck frame 14 to one another, a latch 70 is provided on at least one side of the device 10. The latch 70 can take any number of different forms for securing the two frames together, as may be desired. In the illustrated embodiment, the latch 70 is a gravity latch that self-closes when the step ladder frame 12 and hand truck frame 14 are brought together while in a hand truck configuration. When converted into a dolly configuration, the latch is designed to fall open on its own, allowing the hand truck frame 14 to be rotated into position as a handle.

The device 10 in the hand truck configuration can be used by placing the support plate 54 under an object to be lifted and/or moved and then rotating handle 24 away from the object so as to pivot the device about the second pair of wheels 42, thereby lifting the object. The object then can be moved by rolling the device 10 on the second pair of wheels 42 to a desired location where the lifting process can be reversed to lower the object to the ground.

With reference to FIGS. 4A-4E, a crate 80 can be used in conjunction with the device 10 in order to facilitate the lifting and carrying of objects. In accordance with the present invention, the crate 80 may be any crate of suitable design in structure to be

attached to and carried using the device 10. For example, a collapsible crate such as the one described in U.S. Patent No. 4,798,304 can be modified to include fasteners 82 for securing the crate 80 to the device 10. In one embodiment, illustrated in FIG. 4C, the fasteners 82 may be configured as clamps attached to or are integrally molded with the crate 80. The clamps include C-shaped-notches 83 that receive and frictionally hold the tube framing of the hand truck frame 14. An alternative design, a collapsible crate 80' is illustrated in FIGS. 4D-4F, wherein the fasteners are configured as outwardly-facing cuffs 84 with arcuate outer walls 85 that receive and frictionally hold the elongated legs of the hand truck frame 12. In addition, the arcuate outer walls 84 include slots 86 for receiving pins 88 that are attached to facing surfaces of the hand truck frame 12 as shown in FIGS. 4E and 4F. This configuration provides a more secured attachment of the crate 80 to the device 10, which may be desired in certain applications.

With reference to FIG. 5, the device 10 is illustrated in a step ladder configuration. Device 10 can easily be converted to the step ladder configuration by unlocking the side latches 70 and actuate support plate 54 so as to allow the hand truck frame 14 to be rotated about pivot pin 18 away from the step ladder frame 12. The hand truck frame 14 may be locked into position with relation to the step ladder frame 12 by a locking mechanism 102. The locking mechanism 102 in the illustrated embodiment comprises the rotatably-mounted top step 32 of the step assembly 28. The top step 32 includes a groove 104 (see, e.g. FIG. 1) that receives the cross member 50 (see, e.g. FIG. 1) of the hand truck frame 14 when rotated into a substantially horizontal position, as shown in FIGS. 5 and 6. The locking mechanism 102 further includes a pair of looped arms 106 extending from a distal end of the top seat 32. The looped arms 106 are configured to guide the cross member 50 into groove 104 and to prevent the step ladder frame 12 and hand truck frame 14 from rotating any farther apart. The groove 104 is configured to receive the cross member 50 so as to prevent the step ladder frame 12 and hand truck frame 14 from rotating together. As a safety feature, when the top step 32 is initially rotated toward a horizontal position to lock the step ladder frame 12 and hand truck frame 14 in position, the looped arms 106 initially engage the cross member 50 in a first position 108 (illustrated in FIG. 6) such that the top step 32 (and steps 30, 31) are at an obviously improper angle, and thus insecure. A predetermined amount of force must

then be applied to the distal end of the top step 32 in order to pass the cross member 50 past the looped arms 106 and into the groove 104. As previously mentioned, once the cross member 50 is received within groove 104, looped arms 106 operate to prevent the hand truck frame 104 from rotating from the step ladder frame 12 further than desired  
5 when in the step ladder configuration.

The connecting member 34 is rotatably attached to the seats 30, 31 on one end and rotatably attached to the top step 32 on the other end to provide simultaneous rotation of steps 30, 31 and 32. The steps 30, 31 and 32 are each rotatably attached to the step ladder support frame 12 on both sides, as illustrated in FIG. 5. When the top step 30 is  
10 lowered into place about cross member 50, the lower steps 30, 31 are substantially horizontal and supported at one end by the cross member about which the steps are rotatably mounted at an opposite end by the connecting member 34.

In the embodiment illustrated in FIG. 5, the first pair of wheels 40 and second pair of wheels 42 are attached to the step ladder frame in a slightly different manner than that discussed above. Specifically, the wheel assemblies are attached to a U-shaped bracket  
15 108 that is fitted about an elongated leg of the step ladder frame 12 and attached thereto by a bolt or rivet, as well known in the art. This design may be particularly advantageous in that it limits the number of moveable parts and allows for the removal of the wheels from the step ladder frame 12 by removing the securing bolt, as may be desired in certain  
20 applications.

With reference to FIG. 7, the device 10 is shown in a dolly configuration. The device 10 can be converted into the dolly configuration by placing the device 10 in an orientation to the ground such that both pairs of wheels 40, 42 are on contact therewith. By placing the device on the ground in this manner, the latch 70 automatically releases,  
25 allowing the hand truck frame 14 to be pivoted about pivot pin 18 into a substantially vertical orientation, at an approximately 90 degree angle with respect to the step ladder frame 12. In this configuration, the handle cross member 52 operates as a handle for the dolly, allowing the user to manipulate the movement and direction of movement of the device 10, as desired. A dolly support bar 120 is utilized to secure the hand truck frame  
30 14 in an upright position. For example, the dolly support bar 120 can be pivotally attached to the hand truck frame 14 by cross member 50. As illustrated in FIG. 8A, the

dolly support bar 120 includes a U-shaped clasp 122. When the dolly support bar 120 is rotated toward the first end of the step ladder frame 12, the U-shaped clasp 122 receives the handle 24 of the step ladder frame 12. By design, the U-shaped clasp is configured so the handle cross member 52 can receive forces in any horizontal direction without the  
5 dolly support bar 120 becoming dislodged from the handle 24.

When not in use, the dolly support bar 120 can be stored in an upright position by rotating the dolly support bar into position between the elongated legs of the hand truck frame 14 where it is received by two opposing stops 124, as illustrated in FIGS. 8A-8B. The stops 124 are preferably made from polyethylene plastic, or any other suitable  
10 slippery plastic, and are held in place on hand truck frame 14 by rivets or other suitable fastening means. The stops 124 include an arcuate recess between two protruding lips, one lip extending far enough around the dolly support bar to prevent it from being pushed past the stops 124, as shown in FIG. 8B.

With reference generally to FIGS. 9A-9C, illustrated is an embodiment of a  
15 detachable tray 130 for use with the device 10 in various configurations. The detachable tray 130 has a work surface 130 suitable for holding or supporting work items or work pieces. The first surface 132 can include recesses 134 configured to hold relatively smaller work pieces or work items, or for holding refreshments or the like. Slots 136 are provided at one end of the tray 130 for receiving and holding work pieces and/or work  
20 items, such as gardening tools or cleaning equipment. Notches 138 are provided in the side walls of the tray 130 for securing the tray to the device 10 in the various configurations.

For example, with reference to FIG. 9B, the tray 130 is shown in use with the device 10 in the step ladder configuration, in place over the top step 32. The notches 138  
25 receive cross member 50 of the hand truck support frame 12 and the cross member that rotatably attaches the top step 32 to the step ladder frame 14. If desired, one or more of the notches 138 may include a lateral slot for further securing the tray 130 to the device 10, wherein one or more of the cross members are received into the slots so as to prevent rotational movement of the tray 130 when installed on device 10.

30 With reference to FIG. 9C, the tray 130 is shown in use with the device 10 in a dolly configuration, in place over the step assembly 28. The notches 138 are designed to

receive cross members associated with each step 30, 31, 32 and attached to the step ladder frame 14, thereby securing the tray 130 in place. As mentioned previously, one or more of the notches 138 may include slots for further securing the tray 130 in place. While not required, it is preferred that the tray be fabricated using well known injection molding techniques, and utilizing polypropelene, polyethylene or another suitable material.

With general reference to FIGS. 10A-10C, a detachable tray 150 provides an alternative tray embodiment for use with the device 10. The detachable tray 150 includes a first section 152 and a second section 154 rotatably coupled thereto by pivot pin 156.

10 The tray 150 includes a recess 158 for receiving and holding work items and/or work pieces. While the recess 158 is shown and centrally located in a rectangular configuration, the recess may take other shapes such as square, circle, oval, etc., and may be located at different points on the upper surface of tray 150 and/or on section 154 of tray 150. Notches 160 are provided in the side wall of tray 150 for securing tray 150 to the device 10. One of the notches 160 includes a slot 162 for engaging a cross member of the device 10 for further securing tray 150.

With reference to FIG. 10B, the tray 150 is shown in use with the device 10 in the step ladder configuration. In this configuration, the slot 162 receives the cross member associated with the top step 32 of the step assembly 28 while a second notch 160 receives the cross member 150 of the hand truck frame 12. The second section 154 of the tray 150 is rotated underneath the first section 152 so that the distal end of the second section 154 is received in the U-shaped clasp 122 of the dolly support bar 120. Because of the extended lip on the stops 124 that hold the dolly support bar 120 from passing through the hand truck support frame 12, the first section 152 of the tray 150 can support a relatively significant amount of weight without tipping or overturning the device 10.

In FIG. 10C, the tray 150 is shown in use with the device 10 in the dolly configuration. As with the previous embodiment of the tray, the notches 160 in the side wall of the tray 150 receive the cross members associated with the steps 30, 31 and 32 of the step assembly 28 and attached to the step ladder frame 12, thereby securing the tray 150 to the device 10.

With general reference to FIGS. 11A-11C, illustrated is a detachable seat 180 for use with the device 10 in a step ladder configuration. The seat 180 comprises a molded seat platform 182 and a support 184. Molded seat platform 182 comprises an arcuate seating surface 186, and upper step brace 188 and a lower step brace 190. The upper step brace is configured to extend over and around a step 31 of the step assembly 28 while the lower step brace 190 is configured to rest on and against a lower step 30. Accordingly, the molded seat platform 182 can be mated to the step assembly 28 in a manner so as to support a user that might sit on seating surface 186. For additional support, a support structure 184 may be attached to the molded seat platform 182. In the embodiment shown, the support structure 184 comprises a metal or aluminum tube bent into a U-shape and fitted to the bottom of the molded seat platform 182, as shown in FIG. 11B. However, the support structure 184 can be attached to the seat in any conventional manner, or may be integrally formed with the molded seat platform 182. FIG. 11C shows the seat 180 being attached to the step assembly of the device 10 and the step ladder configuration. In this embodiment, the seat 180 is placed over the lower steps 30, 31 and then lowered into place such that the upper step brace 188 and lower step brace 190 engage the respective upper and lower steps 31, 30.

With reference to FIG. 12, an alternative embodiment for hinge 16 is illustrated. In this embodiment, a hinge 216 is pivotally secured to the step ladder frame 12 and the hand truck frame 14 in substantially the same manner as hinge 16. However, the hinge 216 includes a slotted track 218 for receiving a pin 220 pivotally attached to the hand truck frame 14 at a first end. The pin 220 is received within the slotted track 218 of hinge 216 at a second end so as to slide there within. The pin 220 can be held within the track 218 by various means known to those of ordinary skill in the art, such as by a nut or clamp secured to the pin.

Accordingly, when the device 10 is in the step ladder configuration, the pin 220 is located at a first position 222 that limits the angle of movement between the step ladder frame 12 and the hand truck frame 14. This safety feature prevents the step ladder from falling flat accidentally. In a dolly configuration, the pin 220 is located in a second position 224 that likewise limits the separation of the step ladder frame 12 and the hand truck frame 14. Lastly, when in the hand truck configuration, the pin 220 is located in a

third position 226. The third position is also the intermediate position that the pin must travel through when transitioning between the step ladder configuration and the dolly configuration. Thus, the hinge 216 can operate alone or in combination with other features of the present invention to provide safe operation of the device 10, particularly in the step ladder configuration.

With reference to FIGS. 13 and 14, an alternative embodiment for hinge 16 is illustrated. In this embodiment, a hinge 316 is pivotally secured to the step ladder frame 12 and the hand truck frame 14 in substantially the same manner as hinge 16. However, the hinge 316 includes a spring-loaded retention latch 320. The latch 320 is attached to the hand truck frame 14 and included two opposing spring-loaded buttons 322. The hinge 316 is U-shaped with two parallel sides 324. Each side 324 includes a crescent-shaped slot 326 that receives a respective button 322. Accordingly, the hinge 316 provides a means for limiting the angle of movement between the step ladder frame 12 and the hand truck frame 14, thereby preventing the step ladder from falling flat accidentally. It is sufficient to utilize the hinge 316 on one side of the device 10, though it may be desirable in certain circumstances to include the hinge 316 on both sides of the device.

In order to configure the device 10 as a dolly, the opposing spring loaded buttons 322 can be depressed so that they are no longer extending into the slots 326. This allows the hand truck frame 14 to be positioned in an approximately 90 degree angle with respect to the step ladder frame 12. To assist in the return of the hand truck frame 14 into the step ladder or dolly configurations, ingress grooves 330 are provided on respective edges of the sides 324 of hinge 316. The grooves 330 are configured to receive the buttons 322 and gradually depress them in an automatic fashion as the hand truck frame 14 is moved toward the step ladder frame 12. The buttons 322 are released when they come into contact with the slots 326 as the hand truck frame is moved closer to the step ladder frame 12.

With reference to FIG. 15, illustrated are alternative embodiments for the looped arms 106. Specifically, looped arms 406 can be attached to the top step 32 of the step assembly in any suitable manner, such as by rivets. As with the looped arms 106, the

respective designs of the looped arms 406 operate to secure the top step 32 to the cross member 50 in substantially the same manner as the looped arms 106.

With general reference to FIGS. 16 through 21, an alternative embodiment for hinge 16 is illustrated. In this embodiment, a hinge 516 includes a U-shaped bracket 528 that partially wraps around and is secured to the step ladder frame 12. The U-shaped bracket 528 and the hand truck frame 14 are connected by a pivot pin 532, about which the two frames 12, 14 are pivotally connected. Each U-shaped bracket 528 includes two arcuate surfaces 520 having corresponding notches 522a and 522b formed therein for receiving opposite ends of a pin 526 that is attached to the hand truck frame 14. While two notches are provided on each arcuate surface 520 in the illustrative embodiment, it is within the scope of the present invention to have only one notch or more than two notches, as desired. The notches may be on one side of each bracket 528 or on both sides of each bracket 528 as may be desired and suitable for a particular application of the present invention. The arcuate surface 520 allows the pin 526 to smoothly transition between the notches 522a and 522b as the hand truck frame 14 and step ladder frame 12 move relative to another.

While not shown, the aperture in the hand truck frame 14 through which pin 532 fits is slotted to provide a small amount of radial movement of the hand truck frame 14 relative to pin 532. This enables the pin 526 to be moved in and out of notches 522a and 522b. In an alternative embodiment where the hand truck frame 14 is not slotted about pin 532, the pin 526 may be spring loaded so that pin 526 can be depressed to allow transition of the pin 526 between notches 522a and 522b. In addition, the relative movement of the hand truck 14 about pin 532 may be spring loaded so that the pin 526 is urged into the notches 522a and 522b.

The configurations for the device 10 are determined by the location of pin 526 in either notches 522a or 522b. When the device is configured as a step ladder, as seen in at least FIGS. 16-18, the notches 522a receive the pin 526. An anti-wobble hook 530 may be used to secure pin 526 in notch 522a to prevent the device 10 from collapsing. The hook 530 is rotatably attached to the bracket 528 by pivot pin 529 in a manner so that when the device is placed in a step ladder configuration the hook 530 automatically locks the pin 526 within notch 522a, preventing it from coming out of the notch 522a. The



hook 530 is configured to move into this locking position under the force of gravity.

Alternatively, the hook 530 may be spring loaded to bias the hook into a position that locks the relative movement of the hand truck frame 14 and step ladder frame 12, that is, that locks the device into a fixed configuration. Once the hook 530 moves into place, the device 10 is locked in the step ladder configuration. The anti-wobble hook 530 may be of a substantially J-shaped configuration as illustrated, or any other suitable shape that allows it to prevent the pin from disengaging the notch 522a.

In order to remove the device from step ladder configuration, the hook 530 must be disengaged from the pin 526. The hook 530 may be disengaged from the pin 526, for example, by lifting the top step 32 from the cross member 52 and raising the top step 32 to an upright position as shown in FIG. 19. In particular, an outwardly extending arm 534 at the distal end of the top step 32 engages a perpendicular extension 536 of the hook 530 and causes the hook 530 to rotate away from pin 526, thereby allowing the disengagement of pin 526 from notches 522a. Alternatively, the hooks 530 may be actuated to rotate away from pin 526 by other suitable means, such as by buttons or handles connected to one or more of the hooks 530. The hook 530 may be utilized on one or both of the hinges 516 of a step ladder device, such as the combination device disclosed herein.

When pin 526 is disengaged from bracket 528, the hand truck frame 14 can be moved relative to the step ladder frame 12 into a hand truck configuration or a dolly configuration. As seen in FIG. 20, the hand truck frame 14 can be moved so that pin 526 moves from notches 522a to notches 522b. Notches 522b provide for the dolly configuration of the device 10. The notches 522b are relatively wider than notches 522a to allow for the positioning of the hand truck frame between a push (substantially upright) position and a pull (substantially lower) position. If desired, however, the notches 522b may be the same size as the notches 522a. As shown in FIG. 21, the extensions 536 of the hooks 530 provide, among other things, a flat surface to support the top step 32 from over rotating during use in the dolly configuration. Lastly, the hinge 516 also includes ramps 540 attached to the hand truck frame 14 to protect the bracket 528, pin 526, and hook 530 from loads and to provide a relatively smooth support at the transition from the hand truck frame 14 to the hinge 516.

An alternative embodiment for the brackets 528 is generally shown in FIG. 22. A bracket 600 includes an arcuate groove 610 with notches 612 along one edge. The notches 612 are positioned to allow for particular configurations of the hand truck frame 14 and step ladder frame 12. Moreover, the groove 610 can have more or fewer notches 612 than shown to achieve a desired result.

A pin 618 that is connected to the hand truck frame 14 can move along the groove 610 of the bracket 600 and lock into place in any of the notches 612. As the pin 618 moves along the groove 610, the hand truck frame 14 moves radially with respect to the bracket 600 to allow the pin 618 to move in and out of the notches 612. In addition, the pin 618 can slide to the ends of the groove 610 to provide other configurations of the hand truck frame 14 and step ladder frame 12. The configurations include a ladder mode, cart mode, hand truck mode, wagon mode, furniture dolly mode, and stored mode.

In FIG. 23-24, an alternative embodiment for the detachable tray 150 is shown. In this embodiment, a tray 700 includes a first section 702 and a second section 704. A first end 706 of the second section 704 is connected to the distal end 708 of the pivotal support plate 54. The connection to the pivotal support plate 54 is enabled, in the illustrated embodiment, by a lip piece 710, shown in FIG. 24, disposed at the first end 706 of the second section 704. The lip piece 710 latches on to the distal end 708 of the pivotal support plate 54. As will be appreciated by those skilled in the art, the tray 700 could be connected to the support plate 54 in any suitable manner, such as with a latch, clip, pin, coupler, etc. Further, rather than attach to the pivotal support plate 54, the tray 700 could attach to an added cross member or to the hand truck frame itself.

With reference to FIGS. 25-26, an alternative embodiment for seat 180 is illustrated. The alternative embodiment of the seat 800 connects to the middle step 31 by hooks 814 hanging over the cross member 816 that connect the middle step 31 to the step ladder frame 12. As will be appreciated by those skilled in the art, the seat 800 could be attached to the middle step 31 in any suitable manner, such as with a latch clip, pin, coupler, etc. Further, rather than attach to the middle step 31, the seat 800 could attach to an added cross member or to the step ladder frame 12 itself.

The seat 800 is supported by a leg frame 815 that is U-shaped at a first end 817 and runs to a top section 818 of the seat 800 at a second end 819 where it is mounted to the seat 800.

The device 10 also may include a holder attachment 900. As generally shown in  
5 FIGS. 27-28, the holder attachment 900 is a device used for storing tools such as shovels, rakes, brooms, etc. The holder attachment 900 consists of a U-shaped bracket 922 attached near the first end 924 of the hand truck frame 14. The bracket 922 comprises of a face plate 926 with support members 928 attached at each end of the bracket 922. Each support member 928 has an arcuate brace slot 930 that receives the  
10 cross member 50 as shown.

The arcuate brace slots 930 securely attach the bracket 922 to the hand truck frame 14, when the weight of attachment 900 (and the tools if attached) pivotally move the holder attachment 900 about the cross member 50, forcing the arcuate brace slots 930 against the hand truck frame 14. Utilizing the arcuate brace slots 930, the bracket 922  
15 hangs from the cross member 50 located at the first end 924 of the hand truck frame 14. As will be appreciated by those skilled in the art, the bracket 922 could be connected to the hand truck frame 14 in any suitable manner, such as with a latch, clip, pin, coupler, etc. Further, rather than attach to the hand truck frame 14, the bracket 922 could attach to an added cross member or to the step ladder frame 12, etc.

20 Clamp devices 932 protrude from the face plate 926 of the bracket 922 away from the step assembly 28. The clamp devices 932 are used to grasp and secure the tool that the user wants to store. Moreover, the face plate 926 of the bracket 922 can have more or fewer clamp devices 932 than shown in FIGS. 26.

With reference to FIG. 29, the device 10 may include a trash bag holder 950. The  
25 trash bag holder 950 may attach to the top step 32 and extend outwardly in the direction of the hand truck frame. The trash bag holder 950 may attach to the underside or the top of the top step using any suitable means, such as a hook device or a clamping device. The trash bag holder 950 may be a substantially U-shaped device made of metal, plastic, or any other suitable material. A bottom of a trash bag may be inserted into the trash bag  
30 holder 950 with the top of the trash bag folding over the edges of the trash bag holder. Clips 960 may be used to secure the trash bag to the trash bag holder 950.

An alternative embodiment for securing the top step 32 is generally shown in FIGS. 30-31. In this embodiment, the top step 32 includes a J-shaped retention hook 1050 at the distal end of the step for engaging a cross member 1052 of the hand truck frame 14. The top step 32 lowers onto the cross member 1052 and snaps into place within a recess 1059 on the underneath side of step 32, past the retention hook 1050. The retention hook 1050 can be released by actuating button 1054, which slides the retention hook laterally so as to disengage it from the cross member 1052. In addition, a metal plate 1056 can be attached beneath the top step 32, adjacent at least both side walls thereof, to prevent buckling of the step under heavy weight.

As illustrated in FIG. 32, the device 10 also may include a support plate lock 1060 for securing the support plate 54 in either an upright or lowered position. The lock 1060 rotates on a pin 1064 connected to the distal end of the hand truck frame 14. When the support plate is engaged in a deployed or lowered position, a first end 1066 of the lock 1060 slides over a portion of the support plate 54 to keep the support plate engaged (*e.g.*, perpendicular to the hand truck frame 14). The support plate can be released from the engaged position by applying a force to a second end 1068 of the lock 1060 to rotate the lock 1060 about pin 1064.

As shown in FIG. 33, when the support plate 54 is not engaged (*i.e.*, in an upright position), the second end 1068 of the lock 1060 slides over a side portion of the support plate 54 to hold the support plate in an upright position. The support plate 54 can be released from the upright or stored position by applying a force to the first end 1066 of the support plate to rotate the lock 1060 about pin 1064..

Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.